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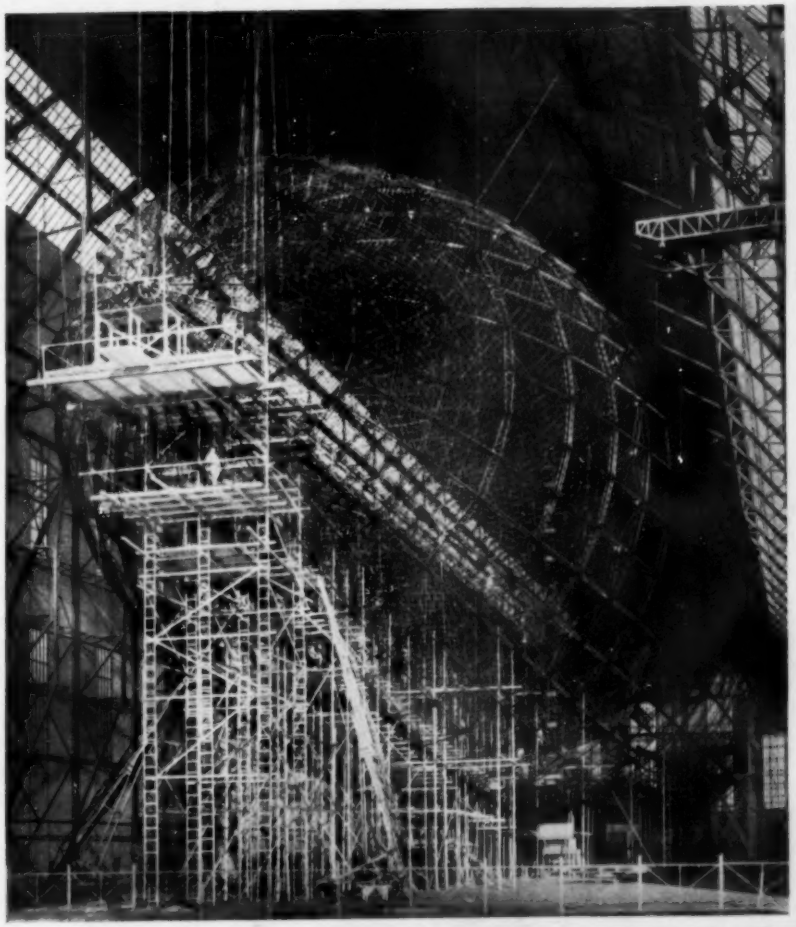
# SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



SEPTEMBER 1, 1934

## Liner of the Sky

See Page 142

A SCIENCE SERVICE PUBLICATION

# SCIENCE NEWS LETTER

*VOL. XXVI* *No. 699*

The Weekly Summary of Current Science

*Published by*

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*Edited by* WATSON DAVIS

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# DO YOU KNOW?

Among Mexican Indians there is an unusual amount of albinism.

The New York State College of Home Economics is drafting a program for management of twins.

The government will spend $200,000 drilling deep wells on Indian reservations in the drought areas of Montana, Arizona, and the Dakotas.

Government soil experts are to begin a survey of a million acres of soil in the mountains of Puerto Rico, to mark out lands that may be cultivated.

Englishmen returning home from far-off Singapore will soon be able to make the trip by automobile, except for the English Channel crossing.

Government chemists have found that eggs deteriorate in storage because they "digest themselves," and now the problem is to prevent this enzyme activity.

China's cotton crop is expected to exceed last year's crop by 15 per cent.

Bees prefer their nectar undiluted with rain or dew, and will visit blossoms accordingly.

Fluorine compounds, increasingly used as spray materials to control crop pests, are a new cause for worry about spray residues on foodstuffs.

Jacksonville, Fla., had the coldest day of its experience almost a hundred years ago, when the city shivered at seven degrees below zero on Feb. 7, 1835.

Sulfur treatment sometimes given to drying fruits to protect them from insect attacks now is found to reduce the vitamin B content of the dried fruit.

The common belief that raw foods are essential to highest physical vigor lacks scientific support, according to a report to the American Chemical Society.

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*These curiosity-arousing questions show at a glance the wide field of scientific activity from which this week's news comes. Book references in italic type are not sources of information for the article, but references for further reading. Books cited can be supplied by Book Department, Science News Letter, at publishers' prices, postpaid in the United States.*

PHYSICS

# Balloons Carrying Radios Tell Stratosphere Secrets

## "Wobble" in Signal Frequency Indicates Altitude; Interruptions Tell of Temperature and Cosmic Rays

SMALL stratosphere balloons without pilots and using tiny radio transmitters to send back upper air information to earth-bound scientists will make possible a whole new program of cosmic ray studies, Dr. Arthur H. Compton of the University of Chicago reported in a statement to Science Service.

The small balloons—quite Lilliputian in size compared with the great 3,000,000 cubic foot bag of the recent National Geographic Society and U. S. Army Air Corps flight—weigh only 16 pounds when sent aloft by a bag whose largest extended diameter is but 15 feet.

The radio "voice" sending back the information to earth is a single tube oscillator transmitting a signal on twenty meters wavelength. A barometer, a thermometer and a cosmic ray meter affect the radio signal in such a way that accurate records of these conditions can be learned. A similar short wave oscillator is kept in continuous operation.

Changing conditions in a special barometer vary the frequency (or what is the same thing, the wavelength) of the transmitted wave. Air pressure, and hence altitude, is thus determined by recording the "wobble" in the incoming radio signal.

### Interruptions Show Temperature

Temperature is recorded by vibrations of a balance wheel somewhat like that of a watch. Its period, or time of oscillation, is affected by the temperature. This mechanical oscillator interrupts the carrier wave at each vibration. Thus the radio signal comes on and goes off at intervals. The difference in length of the time intervals indicates temperature.

Cosmic ray intensities are determined by the current in the cosmic ray meter produced by ionization. The instrument is charged up to a known value. As the cosmic rays make the surrounding air electrically conducting, the charge of the instrument leaks away. How rapidly the leakage occurs depends on the intensity of the cosmic rays. Each complete discharge of the cosmic ray meter is noted by interruptions in the carrier radio wave.

All that is necessary in the ground laboratory, then, are instruments to make a record of the wavelength of the radio signal, telling the air pressure and hence the elevation; and to detect interruptions in the radio signal telling temperature and cosmic ray intensity.

Studies of the upper atmosphere, Dr. Compton stated, have been made before by the system of sending up automatic recording instruments on two small balloons of different sizes. Together the twin bags carry the apparatus aloft until finally the smaller one bursts.

The remaining balloon is insufficient in size to keep up the ascent, so that the apparatus descends gently to the ground. Reward notices are attached to the whole unit payable on the return of the apparatus. Good results have been obtained with this method, said Dr. Compton, by the German scientists Hess and Kolhorster and by Prof. R. A. Millikan in the United States.

While valuable, the method has one defect. It can be used only in regions of the world having a fairly dense population, where there is some assurance that the balloon and its instruments will be found and returned. Europe, the United States and southern Canada comprise the regions of usefulness of the method.

### Expect Loss

Radio balloon apparatus, however, is sent up with little hope—and no need—of its recovery. The cost of $100 for each flight is only a few times that of an airplane flight and only a small fraction of the cost of a manned balloon ascension.

"We do not expect," concluded Dr. Compton, "that this radio transmission method of obtaining cosmic ray data from the stratosphere will replace measurements made in large balloons of the stratosphere type, because some

**THROUGH THE GROVES OF THE SEA**

***The fisher on the glassy waters over coral groves must always be prepared for the strange and beautiful forms of life that may swim into his ken out of the next clump of animate bushes on the botttom. This little "herd" of marine game, photographed by Dr. W. H. Longley of the Carnegie Institution's marine biological station at Tortugas, is good to eat as well as pleasant to look upon. They are gray snappers, rated high among Florida food fishes.***

kinds of measurements can only be made with equipment too heavy for small balloons to carry. Much information, however, can be obtained with these lighter balloons. This will supplement, in regions difficult of access, the more detailed information which the larger balloons give us in ordinary latitudes."

The region of the North Magnetic Pole, in the wilds of northern Canada, is expected to be one place where small radio balloons will be especially useful. The difficulties of transporting and launching a large manned balloon in the wilderness and the hazards which the balloonists would face on the landing exclude this method from any scientific program. The chances of recovering instruments by rewards would also be small, so that the radio type balloon seems to be the one solution to the problem in wild regions. Yet stratosphere measurements at the North Magnetic Pole would be among the most interesting of all. Ground measurements have been made at this point but upper air information is needed to supplement them.

Prof. J. M. Benade, Indian scientist from Forman Christian College at Lahore, India, developed the idea of using radio signals to transmit cosmic ray intensities, Dr. Compton said.

*Science News Letter, September 1, 1934*

CHEMISTRY

# Citric, The Acid of Lemons, Found Now in Tobacco

CITRIC ACID, that makes lemons and grapefruit sour, is now being extracted from tobacco in Soviet Russia. Chemists have discovered that what, in part, makes poor tobacco bad for smoking is the presence of citric along with other acids like malic, oxalic and fumaric.

Using the citric acid from tobacco, Soviet chemists hope to free the U.S.S.R. from the necessity of importing this valuable chemical compound. Much of the citric acid which the U.S.S.R. buys each year comes from Italy, where it is extracted from lemons. In 1929 the Soviet Union had to purchase 142 tons of the acid from Italy alone, according to *Industrial and Engineering Chemistry*.

Prof. A. A. Shmook of the Soviet Tobacco Industry Institute has worked out a process for taking the citric acid out of the poorest varieties of Russian tobaccos. High-grade smoking tobacco contains very little acid and at times it is even absent altogether. In the cheap varieties the citric acid may be present in amounts up to 4 per cent., and even higher.

### Equally Good Sources

Lemon juice, for comparison, is found to consist of about 3 per cent. citric acid and sometimes reaches 6 per cent. As sources of raw material for the production of the acid, lemons and tobacco are about equal. The U. S. S. R. raises much tobacco and few lemons. Hence the concentration on a way to obtain the acid from one of Russia's natural resources.

The manufacture of citric acid from fruits or plants containing sugar is not being neglected by the Russian chemists, however. One plant at Leningrad makes two tons of citric acid a year in this way, while another is under construction at Moscow which will have a production of eight tons.

Making citric acid from sugar-bearing substances is accomplished by adding a fungus growth to start fermentation. Citric acid has been produced all over the world in this fashion since 1896.

### Two Stages

The process runs in two stages: the formation of a musty fungus film and allowing the fungi to turn sugar into citric acid. Five or six days is necessary for the method. At the end of fermentation the citric acid is separated from the messy solution by a method similar to that in which citric acid is taken direct from lemons.

*Science News Letter, September 1, 1934*

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When preparing perishable foods, such as chicken salad, for a large gathering, says one health officer, it is wise to prepare small bowls kept chilled, rather than to work with one large bowl, since bacteria get a better start in life in the warmish contents of the big, slowly filled bowl.

ANIMAL PSYCHOLOGY

# Dogs Recognize Words By Their Sound Alone

DOGS LEARN the meaning of certain words very well and are not fooled by similarly sounding words. Nor are they fooled by certain other circumstances purposely introduced to confuse them. These facts were brought out by extensive experiments made by Dr. Emanuel Sarris at the Institute for Environmental Research, at Hamburg, Germany.

Several dogs were used. They were given such names as Paris, Haris, Aris, Argos, Niki, etc., some of which have very similar sounds, others very different. The dogs learned to respond to their respective names perfectly. They were then taught a few simple words and phrases of importance in the dog world, such as meat, stick, basket, on the chair, under the table, etc. Once having learned these words and phrases, they recognized them under a variety of confusing circumstances by their sound alone, independent of tone of voice or emphasis, and without the help of signs or gestures. They recognized them when mixed with other words, when the speaker and object were out of sight, and whether the voice was male.

### Word Order Not Cue

Thus, the dogs being in one room and the experimenter in another, such commands as the following were given: "Come, Paris, (or Haris, or Aris, etc.,) to the meat"; "Come to the meat, Paris," "Paris, come to the meat." In each case the appropriate dog did the appropriate thing. Variety of phraseology and similarity of sounds did not confuse.

Aris was sung to in Greek. In the midst of the poem, one of the words he knows was inserted, but it was sung in the same tone and rhythm as the rest of the poem. Aris recognized it at once and acted accordingly. Later he learned the Greek equivalent of the word.

Aris was taken into a room in the Institute where he had never been before. "On the chair," commanded his master, without moving a muscle. Aris ran all around the room searching and stopped finally at a chair turned over on its side. He looked at it dubiously for a few seconds, then jumped on top of it. In a similar way on different occasions he accepted a stool up-side-down, a stool on top of another, a bench, and a chair wrapped up in paper.

*Science News Letter, September 1, 1934*

VETERINARY MEDICINE

# Debate Value of Vaccine For Tuberculosis in Cattle

## Guérin, Supported by Briton, Claims High Value; Americans and Germans Pin Faith to Eradication

WHAT TO DO with the tuberculous cow?

Kill her?

Or give her "shots" of vaccine, in an endeavor to make her immune?

This question, which stirred up actual armed insurrection against State and Federal authorities in the Midwest not so long ago, agitated the recent meeting of the Twelfth International Veterinary Congress in New York. Eradicationists and vaccinationists lined up and discharged scientific broadsides in the briskest exchange of conflicting views that enlivened the session.

Dr. A. E. Wight of the U. S. Department of Agriculture, who has charge of the eradication work under the bureau of animal industry, stoutly defended the American method of eradication, claiming statistically demonstrable practical results.

"There has been a considerable reduction in the number of cattle and hogs found to be affected with tuberculosis, at packing centers operating under Federal supervision," he declared. "Since 1916 tuberculosis in cattle slaughtered, exclusive of known reactors, decreased from 2.35 per cent. to 0.4 per cent. Since 1924 the percentage of tuberculosis in hogs slaughtered under Federal supervision decreased from 15.2 per cent. to 10.5 per cent."

### B. C. G. Originator Defends

Equally stout defense of the vaccination method was presented by Dr. C. Guérin, chief veterinarian at the Pasteur Institute of Paris. Dr. Guérin is one of the originators of the widely known B.C.G. vaccine.

He declared the eradication method to be "inoperable and antiquated," and claimed for his own method that "The oral or subcutaneous introduction of living but non-disease-producing tuberculosis bacilli, such as B.C.G., into the body, is capable of producing an allergic state in man as well as in animals. It affords them, also, the benefit of a resistance against tuberculsosis infection comparable to that which tuberculous animals possess naturally. The harmlessness of the B.C.G. vaccine for cattle is not questioned by anyone. The benefit which has resulted from its application in a number of European countries justifies the popularity which it enjoys."

Dr. E. A. Watson, of the Canadian Department of Agriculture, reported no benefits to large numbers of cattle treated with vaccine under his supervision.

He stated: "The incidence of tuberculosis in the aggregate was exactly the same in the vaccinated and unvaccinated cattle. . . . The average degree of tuberculosis was less in the young, immature animals but greater in the maturing animals in the vaccinated class than in the unvaccinated, and in the aggregate was nearly the same for each class with a slight but insignificant difference in favor of the vaccinated. The anatomic distribution of the disease shows a location of glandular and pulmonary tuberculosis in the vaccinated cattle very similar to that in the unvaccinated, or without any significant differences."

Prof. J. Basil Buxton, director of the Institute of Animal Pathology, University of Cambridge, England, reported apparently contrary results following experiments on calves.

"Whether given by mouth or intratracheally, or by subcutaneous or intravenous injection," he said, "B.C.G. can raise the resistance of a calf to a virulent experimental infection. . . . Double intravenous inoculation gave complete immunity, three months after vaccination, to the oral administration of virulent bovine cultures."

Admiration for American methods and results was expressed by Prof. Wilhelm Zwick of the University of Giessen, Germany. But a different method of eradication of susceptible animals is necessary under German conditions. He expressed skepticism of the value of vaccination, saying:

"All the protective vaccination methods used so far have failed. The accounts of the B.C.G. vaccine of Calmette-Guérin are not yet sufficient on which to pass judgment. From past experience there is a tendency in Germany to be cautious."

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STRANGE FRUITS ON A WILLOW TREE

***Willows apparently trying to be pines or spruces, at least to the extent of producing cones, are likely to bring a mild note of wonder to cross-country ramblers. But the queer cones are not the result of misguided botanical ambition on the part of the willows; they are only the poor trees' response to an act of aggression by an insect. The stimulus that provoked them came from the sting of one species of gall-fly, a tiny insect that lays its eggs in tender plant tissue—in this case the growing tip of the willow shoot—and then irritates it into a pseudo-tumorous overgrowth, within which the growing larva will find an abundance of tasty food. The photograph was taken by Cornelia Clarke.***

ASTRONOMY

# The Swan Swims a River of Light

## The Milky Way, With Giant Scattered Suns Crowded Into Haze by Distance, Is the Great Bird's Background

By JAMES STOKLEY

CYGNUS, the swan, sometimes called the "northern cross," dominates the evening sky of September. It is close to the zenith, with the vertical part of the cross extending from southwest to northeast. The bright star to the northeast, Deneb, marks the head of the cross and also the tail of the swan. The row of stars off to the southwest represents the bird's long neck, outstretched in flight. His wings are formed by the stars that outline the arms of the cross.

Directly west of the cross is a star that is brighter even than Deneb—the brightest star, in fact, to be seen at present in the evening sky. This is Vega, in Lyra, the lyre. To the south of Cygnus is a third bright star, flanked above and below by two fainter ones, Altair, a part of Aquila, the eagle. Deneb, Vega and Altair form a huge right triangle which is a convenient guide from which to find other stars.

Another brilliant star of the evening skies of late summer can be seen low in the northwest at the bottom of a constellation shaped something like a kite. The constellation is Bootes, the bear-driver, and the star is Arcturus. Between Lyra and Bootes is Hercules, a large constellation, but one which contains no first magnitude stars.

### "Milk Dipper" in South

To the right of Bootes is the great dipper, and to the left is the group of Ophiuchus, and the serpent which he is holding. These two likewise contain no very brilliant stars. Almost directly south, just under Aquila, is Sagittarius, the archer, containing a well known little group, the "milk dipper." The bowl of the dipper is turned downwards, and the handle extends to the right into the Milky Way.

To the left of Sagittarius is Capricornus, the sea goat. Here we now find Saturn, with its brilliant, steady gleam, quite different from that of the stars. Saturn, of course, is a planet, a member of the family of bodies which circle around the sun, the solar system of which the earth is part, while the stars are other suns, at vast distances.

Low in the southeast is a bright star which is one of the most southern objects which can be seen from most of the United States. This is Fomalhaut, in Piscis Austrinus, the southern fish. Just above it is Aquarius, the water carrier, supposed by the ancients to represent an old man carrying a water jar, whence the water is flowing into the fish's mouth. High in the east is a square of four stars, of similar brightness, standing on one corner. This is the "great square of Pegasus." Only the three southernmost stars, however, are in Pegasus, the winged horse, the fourth being part of Andromeda, the chained lady. Below the square is a group of stars forming some more fishes, the constellation of Pisces.

### Familiar "W" in North

Quite low in the northeast is the brilliant star Capella, in Auriga, the charioteer; but most of him is below the horizon until late in the evening. Next towards the east is Perseus, the mighty champion, who stands now entirely above the horizon, and above him, and shaped like a W on end, is the group of Cassiopeia, the queen, mother of Andromeda. All these constellations, and others, are indicated on the accompanying maps, which show the stars as they appear about 10 o'clock standard time, at the beginning of the month, or about 8 o'clock at the end.

This is a good month of the year in which to see that broad band of light that extends across the sky, which we call the Milky Way. It passes through the constellations of Sagittarius, Aquila, Cygnus, Cepheus, Cassiopeia and Perseus, so that this month it goes from the northeastern horizon directly overhead and down to the southwest. Unfortunately, however, the Milky Way is a stranger to many people today. It can easily be seen in the dark sky of the country, but with the competition of city lights and their attendant glare in the sky, it fades from sight. Fortunate are those who can occasionally get away from the proximity of the city and can then appreciate it.

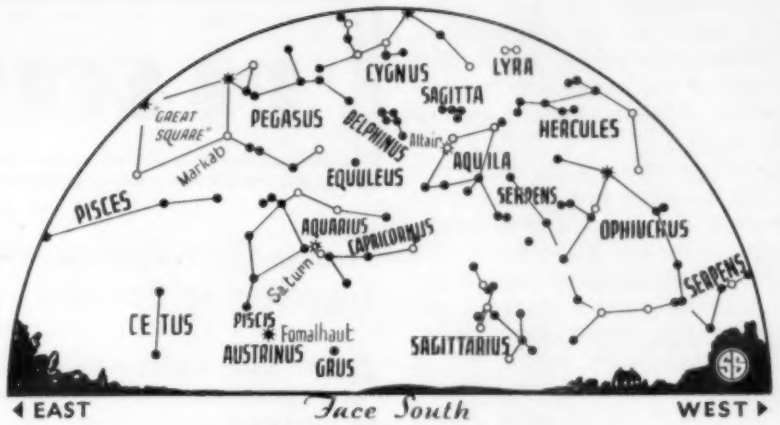
Even a pair of opera glasses will suffice to show the nature of the Milky Way. They reveal that it consists of countless millions of stars, each one so distant and so faint that it can not be seen by the unaided eye, but together their light combines into this luminous pathway.

The Greek philosopher, Democritus, in the fifth century B.C. suggested that it was so composed, but it remained until 1610, when the Italian astronomer Galileo turned his first little telescope upon it, that the stars of which it consists were actually seen.

✲ ✷ ○ • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS

CYGNUS AT THE ZENITH

*Known also as the Northern Cross, the constellation of the Swan is a splendidly conspicuous sky-mark on the Milky Way.*




**SATURN RIDES THE GOAT**

***Conspicuous among the scintillating bright stars by its steadier, unwinking light, the ringed planet rules the September evening skies.***

It is a far cry from Galileo's observations to the modern photographic telescopes at our great observatories which record, on a single plate, thousands upon thousands of stars crowded together in vast clouds. And every one of these stars is a sun, similar to our own, and perhaps some of them, at least, have planets revolving around them. But they are at such distances that even with the most powerful telescope, the stars all appear as mere points of light.

The question of planetary companions, and especially the possibility of their being inhabited, lies entirely within the realm of speculation. No instruments now in existence or even contemplated are capable of revealing the answer.

Not all parts of the Milky Way are bright. Even with the naked eye, certain dark patches can be seen, such as those in Cygnus and in Sagittarius. Another is in the southern hemisphere of the sky, in the heart of the southern cross, which can not be seen from these northern latitudes. They are often termed "coal sacks" and at one time were thought to be actual "holes in the sky," regions devoid of stars.

### Dark Veils Against Light

If they were holes, however, they would have to be tubes through the starry swarm, and directed exactly towards us. This is most unlikely, and so now it is universally believed that they are clouds of dark material, silhouetted against the background of stars. It has been suggested that the ice ages on the earth occurred when the solar system passed through such a cloud, and the radiation received from the sun was thus diminished.

Probably there are large masses of such dark matter scattered around the universe, but it can be seen only when it happens to be in front of a bright background. Perhaps the stuff of which these clouds consist is what remains of stars that have once glowed but have long since cooled, or, on the other hand, it may be the elemental building material from which the stars are formed. Having no light, it can not be observed by that very powerful tool of the astronomer, the spectroscope.

### Heavenly "Grindstone"

The Milky Way is a most significant feature of the sky, for it represents the vast majority of the stars in our system. The sun and all the other stars that we can see in the night sky with the naked eye, or even with all but the most powerful telescopes, form a system called the galaxy. This is shaped like a grindstone, and is so vast that a beam of light, even though it travels fast enough to encircle the earth seven times in a second, would take several hundreds of thousands of years to traverse its diameter. The solar system is not far from the center of the galaxy.

When we look out towards the edges of the grindstone, we see a much greater concentration of the stars than when we look to the sides. This concentration of stars around the edge forms the Milky Way and, though the stars there appear to be very close together, this is only on account of their distance. The distance of the sun from alpha Centauri, its nearest neighbor, approximately 25,000,000,000,000 miles, is typical of the distances between the stars.

Formerly it was supposed that our galaxy included all the objects that could be observed with any telescope, but during the last decade it has been shown that there are thousands and thousands of other galaxies, outside the limits of our own, consisting, like it, of vast swarms of myriads of stars. The discovery of still more of these, at greater and greater distances, and the more detailed study of the close ones, are among the most important problems to be put to the great 200-inch telescope that is now under construction for the California Institute of Technology.

On September 23, at 12:46 p. m., eastern standard time (11:46 a. m., central standard; 10:46 a. m., Mountain standard; 9:46 a. m., Pacific standard) the sun, which has been moving southwards in the sky since June, reaches its halfway mark, and crosses the heavenly equator. This is taken as the time of the beginning of autumn, it is the autumnal equinox. On that date, the sun will rise directly east, set directly west, and will be in the sky for twelve hours, just as long as it will be below the horizon. Hence the name "equinox," meaning "equal night."

*Science News Letter, September 1, 1934*

ASTRONOMY

## Meteor Spectra Captured In Novel Red Light Photos

TWO UNUSUAL meteor photographs were captured at the University of Toronto's Dunlap Observatory by Dr. P. M. Millman during observations of the Perseid meteor shower. They are spectra taken with special red-sensitive plates. It is expected that they will give new information about the composition of the meteors.

*Science News Letter, September 1, 1934*

### Phases of the Moon

| | | E. S. T. |
|---|---|---|
| New | September 8 | 7:20.1 p. m. |
| First Quarter | September 16 | 7:25.9 a. m. |
| Full | September 22 | 11:18.9 p. m. |
| Last Quarter | September 30 | 7:29.2 a. m. |

PHYSICS

## Radio Waves Cook Egg From the Inside Out

PROF. Jellinek, French scientist, placed a raw egg between two condenser plates connected to a short wave radio transmitter. The power applied was 1000 watts, the wavelength three meters. After five minutes exposure, the yolk of the egg was found to be cooked hard and solid, but the white was scarcely affected, being only of the consistency of a jelly. Thus the egg was cooked from the inside out. Yet the temperature of the yolk at the end of the cooking was only 140 degrees Fahrenheit, while that of the white was 176.

This experiment was not performed as a stunt, but as part of a serious and extensive research on the effect of short radio waves on different organic tissues, which Prof. Jellinek recently reported to the Paris Academy of Sciences.

The eye of an ox was similarly experimented upon, and it was found that while the crystalline lens was little affected, other parts of the eye were greatly affected.

It is important to study this selective action of the waves, and their different heating effects on different tissues, Prof. Jellinek said, because of the recent use of short waves for therapeutic purposes.

*Science News Letter, September 1, 1934*

METEOROLOGY

## Heavy Rains in Southwest Encourage Fall Plowing

HEAVY RAINS over the whole of Oklahoma during the week ending Saturday, Aug. 25, together with other extensive rain areas over Missouri, southeastern Iowa, Illinois and on up the Ohio Valley, have put many hundreds of thousands of acres into condition for fall plowing and seeding. This relieves some of the anxiety that has been felt over next year's wheat crop prospects; for the success of winter wheat depends to a large extent in getting it into the ground early enough to give it a good fall growth, ready to be snowed under and thus protected when winter comes.

The cutting through of the southern part of the drought-afflicted area by a zone of solid rain raises anew hopes that the grip of the general aridity may at last be breaking. The rains that fell in the West during July and early August came for the most part in the northern part of the area. The attack of the northwesterly storms was only a "nibbling" at the entrenched front of the drought; now has come a genuine "break through."

However, in spite of the relief that the recent rains have brought to anxious watchers of the agricultural situation, they are under no illusions that the drought has been forced into full retreat. Many more fall rains must come, and much long-lying winter snow, before there is enough water on the land to make up for serious seasonal deficits that run back as far as 1930. Subsoil as well as surface is depleted of moisture, and several whole years of excess precipitation will be needed to restore the land to normal condition.

*Science News Letter, September 1, 1934*

CHEMISTRY

## Gallium, Rare Element, Found in Siberia

GALLIUM, rare chemical element, has been extracted from minerals found in the Altai Mountains of Siberia, Prof. V. E. Zviagintzev, of the Russian Academy of Sciences, has revealed.

Gallium is a metal which melts in hot weather at 30 degrees Centigrade or 86 degrees Fahrenheit, becoming liquid like mercury. Its boiling point is greater than 1600 degrees Centigrade (nearly 3,000 degrees Fahrenheit) which is higher than that of mercury's 356.9 degrees Centigrade, or 675 degrees Fahrenheit. It is therefore more useful than mercury in the manufacture of thermometers for use at high temperatures. Gallium is also used in medicine.

The existence of gallium was predicted in 1869 by the Russian Mendeleeff, who developed the periodic table of chemical elements. It was discovered two years later by the French chemist, Lecoq de Boisbaudran. So far only relatively small quantities of gallium have been available, extracted mainly in Germany and in the United States.

In 1931, Prof. Grinberg of the Institute of Platinum of Leningrad suggested that the zinc ores of the Ridder deposits in the Altai might contain the rare element, as do the Canadian deposits. The Institute of Rare Metals of Moscow took up the suggestion. Spectroscopic analysis of the Ridder zinc ores showed the presence of gallium, and treatment of zinc concentrated yielded a small amount of gallium oxide.

*Science News Letter, September 1, 1934*

# IN SCIENC

PHYSICS

## "Inside-Out" Particle Suggested by Germans

EVER increasing in number are the suggestions that the neutral atomic building block—the neutron—may consist of a central negatively charged core and positively-charged electron. Latest of the scientific prophets of the neutron's composition are Dr. Schuler and Dr. Th. Schmidt of the Astrophysical Institute of Potsdam.

The negative proton suggested as the central part of the neutron has been put forward by many scientists in the last year.

Since the usual view of a neutron's makeup is that it consists of a positively-charged nucleus—a proton—plus a negatively charged electron, the new reverse picture would make the neutron an "inside-out" particle.

*Science News Letter, September 1, 1934*

ORNITHOLOGY

## "Hay-Wire" Construction Suits South African Crows

"HAY-WIRE" architecture has been used with satisfactory results (to themselves) by South African crows. This is well attested by a wire nest weighing twenty pounds, taken off a high steel transmission-line tower near Colenso, Natal, and now in the Museum at Pietermarizburg.

The transmission line runs through a nearly treeless district, and the crows have taken kindly to the lofty towers as nesting sites. Brushwood sticks, their usual nest material, would be difficult to fix in position on the slippery metal.

Whether the crows definitely realize this or not, they have at least taken to the use of odd scraps of wire, bending them around the iron framework so securely that it was difficult to dislodge the nest taken for the Museum.

The nest contained a considerable variety of wire pieces, including hard-drawn copper, galvanized iron in two gauges, barbed wire and baling wire.

*Science News Letter, September 1, 1934*

# NCE FIELDS

OCEANOGRAPHY

## Bottle Drifts Seven Years On Long Sea Wanderings

DRIFTING a distance probably more than a third of the earth's circumference, a sealed bottle tossed from the bridge of the American steamer Hahira more than seven years ago was finally washed ashore on the coast of Texas, states a report to the Hydrographic Office of the U. S. Navy.

The paper in the bottle showed that it had been launched by Second Officer A. C. Barstow of the Hahira on April 20, 1927, in latitude 30 degrees 24 minutes north, longitude 79 degrees 35 minutes west. This is between the Bermudas and the southern Atlantic coast of the United States. The ocean currents, however, flow in a direction that would preclude its drifting directly to the point where it was found. More probably it made the entire circuit of the North Atlantic, through the Caribbean and into the Gulf of Mexico, covering an estimated distance of 8,800 miles on its long and lonely voyage.

*Science News Letter, September 1, 1934*

PHYSICS-BOTANY

## Toxicity of Ultraviolet Varies With Wavelength

ULTRAVIOLET rays kill plants in shorter or longer time, and with greater or less expenditure of energy, according to the particular wavelengths used. Researches bearing on this point have been conducted at the Smithsonian Institution by Dr. Florence E. Meier, and are discussed in a new Smithsonian Institution publication.

Dr. Meier's method was to coat a glass plate with a film of living one-celled algae, microscopic water-plants, and then to project on it a band of ultraviolet radiation which had been split up into its component wavelengths by means of a prism, just as white light can be split into a spectrum or artificial rainbow.

Studying the killing effects of eight different wavelengths in the ultraviolet, Dr. Meier discovered that each had its own specific "radiotoxic spectral sensitivity"; that is, its minimum quantity that would sooner or later result in death. Each wavelength also had a specific "radiotoxic virulence"; that is, the measure of time required to produce the killing effect.

The two qualities do not necessarily go together. Some of the wavelengths would kill the algae with a very small dose, but required a long time to do it. Other wavelengths had to be applied in larger doses, but killed more quickly.

To illustrate her point, Dr. Meier used the analogy of poison-effects on human beings. Radium in watch-face paint will kill in extremely small doses, but may take years to finish off its victim. A considerably larger quantity of rattlesnake venom is required to kill, but if that quantity is used, death is a matter of a few hours at most.

The wavelengths of ultraviolet radiation studied by Dr. Meier ranged between 3022 and 2536 Angstrom units. An Angstrom unit is a ten-millionth of a millimeter, and a millimeter is approximately a twenty-fifth of an inch.

*Science News Letter, September 1, 1934*

PHYSICS

## Shooting Neutrons at Zinc Makes Radioactive Copper

BOMBARDMENT of the metal zinc with the nonelectrical particles known as neutrons has turned it into radioactive copper, report Drs. C. A. Westcott and T. Bjerge of Cavendish Laboratory of Cambridge University in *Nature*.

Radioactive copper disintegrates like all the other similar elements produced artificially in the laboratory, but the atomic breaking-down process continues for hours, so that copper is a record-holder in this respect.

The Cavendish investigators report that its half period is six hours, i.e., in six hours the disintegration is only half as intense as at the start. Most elements made to undergo radioactivity by artificial means last, at the most, only a few minutes.

Some naturally radioactive elements like radium take years, even thousands and millions of them, to decrease to half the original amount.

Some, on the other hand, last only a few seconds or minutes like the artificially-produced kind. The six-hour half-period for copper is a duration record in its class.

*Science News Letter, September 1, 1934*

AVIATION

## Early Wright Airplane To Franklin Institute

AFTER gathering dust in a barn near Manoa, Pa., for 21 years, one of the early airplanes of the Wright Brothers will soon be moved to The Franklin Institute of Philadelphia.

The plane is powered with a Wright four-cylinder motor, and is of the "pusher" variety with twin propellers mounted behind the pilot. A chain drive connects motor and propellers. This was the first plane to make a non-stop flight from Philadelphia to Atlantic City, which was accredited as being one of the greatest flights in its day.

The now-antiquated aircraft is being rebuilt under the immediate advice of Dr. Orville Wright by Townsend Ludington and Arthur E. Arrowsmith.

*Science News Letter, September 1, 1934*

MEDICINE

## Rheumatism Treated With "Electric Fever"

FEVER induced by high frequency electric currents is now being used with some success in treating chronic infectious arthritis, popularly known as rheumatism.

This treatment, results and limitations, were reported to the Illinois State Medical Society at Peoria by Dr. D. E. Markson, Northwestern University School of Medicine. Dr. Markson's report was based on two years' experience, during which time 180 treatments were given and 28 patients were treated.

Of particular interest is the fact that 10 patients of this group had received treatment ranging from 2 to 24 months previous to the fever treatment and the duration of the arthritis ranged from 1 to 5 years. In other words, these patients showed improvement under this treatment, while their conditions were considered intractable in the regular arthritis clinic.

The method consists of raising the general body temperature to 104 degrees Fahrenheit by means of high frequency currents. The patient is carefully insulated against heat loss, and this high temperature is maintained for eight hours. The method is safe because the treatment may be terminated very easily in the event that the patient reacts unfavorably.

*Science News Letter, September 1, 1934*

PHYSICS

# 21,000 Photographs Help Measure Energy of Atoms

ATOMS SEEM to have within their hard and heavy central cores a large variety of energy stages, two Rice Institute scientists have discovered at Houston, Texas, after taking more than 20,000 photographs in atom-smashing experiments.

In the laboratory of Prof. L. M. Mott-Smith and Dr. T. W. Bonner, atoms were made to shoot off tiny particles called neutrons. From the way these neutrons collided with neighboring gas atoms it appears as if the core, or nucleus, of an atom may be likened to a fortress firing projectiles at the enemy. The scientists with their measuring instruments were the "enemy."

### Differ in Energy

The observers in the "range of fire" found that all the atomic projectiles did not strike with the same energy. Some were powerful as if from 16-inch guns; others were more like rifle fire. Within the atom, it is believed, the different strengths of the "guns" correspond to the different states of energy which drive off the atom particles.

Important to science is the discovery, for instance, that the light and comparatively rare element beryllium has within its nuclear core 20 or more different steps of energy; 20 different atomic "guns" of varying caliber. Scientists have been thinking of energy within the atom as having only a few levels. The new discovery is expected to aid the understanding of how matter is put together.

To make the atoms shoot off the various particles and so make possible some estimate of the energy forces producing them, Prof. Mott-Smith and Dr. Bonner bombarded targets of calcium fluoride, boron and beryllium with alpha particles, or helium nuclei, like those given off by radium. When they did this the atoms of the target liberated non-electrical particles called neutrons. These neutrons shoot off into a chamber filled with gas atoms where they could collide with the gas atoms present. This impact was the "battlefront" on which the scientists watched to learn the atomic secrets.

Through the quartz window in their apparatus, called a Wilson cloud chamber after its inventor Prof. C. T. R. Wilson of England, the collisions of the neutrons and the gas atoms were photographed. As the neutrons hit the gas atoms they drove out positive particles that physicists call protons. The range of the proton tracks is a measure of the neutrons' energy; and in turn, a measure of the energy forces within the atoms of the target.

### 21,000 Obtained

Some 21,000 atomic "battlefront" pictures were obtained, report the Rice Institute scientists. Nine thousand snapshots were made when the calcium fluoride target was giving off the neutrons, 4,000 were taken with boron as the target, and 8,000 more when beryllium was used.

In no case were the neutrons given off in constant energy groups. The range of the recoil particles—the protons—fell, instead, into different groups. Some would bounce back a certain distance; others would travel farther before stopping. The range observed is a measure of the neutron "bullets" just as the penetration of a real bullet into a block of wood is a measure of its energy.

Analyzing thousands of photographs, the scientists found that in fluorine there were five different groups of neutrons emitted. The more energetic was equivalent to 2,500,000 electron volts energy.

For boron eight groups of neutron energies were found. The strongest was equal to 4,160,000 volts energy. For beryllium there were over 20 groups and the maximum energy detected was 11,700,000 volts.

The experiments of Drs. Mott-Smith and Bonner are published in the *Physical Review*.

*Science News Letter, September 1, 1934*

▼ RADIO ▲

THE DUTCH ELM DISEASE

an address by

Dr. Stanley B. Fracker

In charge of the Division of Domestic Plant Quarantines, U. S. Department of Agriculture

Wednesday, Sept. 5, at 3:30 p. m., Eastern Standard Time, over Stations of the Columbia Broadcasting System. Each week a prominent scientist speaks over the Columbia System under the auspices of Science Service.

VOLCANOLOGY

## Stromboli is "Safe" Volcano Because of Its Eruptions

STROMBOLI, island volcano off the coast of Italy which has lately been threatening with lava flows the vineyards on its slopes, is nevertheless rated as one of the "safest" of the world's volcanoes. Paradoxically, it is seldom dangerous because it is almost constantly in eruption, growling and sputtering and roaring away, throwing out incessant small quantities of ash and pumice, and in general expending its energy as fast as it accumulates, instead of storing it up in a long, suppressed geologic grouch, ending in a violent and destructive blowoff, after the manner of its better-known mainland neighbor, Vesuvius.

The action of Stromboli is not, however, incessant and constant, like a well-regulated fountain in a park. It is rather a succession of real explosive volcanic eruptions, but spaced apart by minutes instead of years or centuries.

Before the present outflow of lava there were others: the most recent in 1930; back of that, lava eruptions in 1889, 1891 and 1907. But they were all comparatively mild affairs, confining their mischief generally to the destruction of vineyards. In all recorded history, Stromboli has never been charged with the taking of one human life.

Stromboli has a neighbor-volcano, also an island-former, that bears the distinction of being the "type" specimen of its genus; that is, its name has become the name of all mountains of its kind. It is called Vulcano.

This is the mountain that the ancients believed formed the chimney of Vulcan's under-earth smithy. Here the lame, swarthy artizan-god forged thunder-bolts for Jupiter, while his pretty wife Venus, tired of her marriage-of-convenience, was out flirting with that handsome but dangerous fellow, Field-Marshall Mars.

*Science News Letter, September 1, 1934*

ANTHROPOLOGY

# Blonde, Nordic Mothers Are Likeliest to Have Twins

## Publicity Given Every Birth of Twins Makes Twinning Seem More Frequent Than it Really Is

**This is the second of a series of two articles on multiple births in human beings. It deals especially with the statistical probabilities of twin births and with the physiological reasons for such occurrences.**

DO YOU want to know the chances for having a multiple birth in your own family?

The likelihood depends partly on whether you already have a history of twins or triplets in the family. Most multiple births occur in a family which has known them before, either on the father's or the mother's side.

The age of the mother affects the chances for a multiple birth. It is most likely when the mother is between the ages of 35 and 40. The number of children already born to the mother does not seem to make any difference.

The race of the parents seems to affect the chances. The Nordic races have more multiple births than do the Alpines or Mediterraneans.

Blondes are more likely to have the double blessed event than are brunettes.

Can the physician tell before the birth how many are coming? It is reported that Dr. A. R. Dafoe, the physician who so successfully brought the Dionne five into the world, did not know beforehand of their multiplicity.

### Revealed By Heartbeat

Ordinarily, however, it is possible for the physician to diagnose the condition when the mother has more than one child. He can hear more than one heart beat from the infants; he can perhaps detect more than one head; and if he has the aid of the X-ray, he can see more than one skeleton. If there are triplets, though, he will be very likely to think they are twins.

Dr. Dafoe did not see the Dionne mother until one week before the birth of the infants, and at that time, because of a special condition, the diagnosis of multiplicity could not be made.

The mother who is under the care of a physician before the birth is most likely to be forewarned if she is to have twins or quintuplets.

The publicity given to twin births makes them seem more common than they really are, yet it is probably their very rarity that makes them arouse so much interest.

In one year in the United States over one million births were reported: the exact number was 1,399,975. Yet the twin births reported for the same year numbered only one for each 93 births. Only about one person out of every 47 is of twin origin.

### Not More Than 2,500,000

Probably there are not more than two and a half million twins in the whole United States.

The number of cases of the birth of larger numbers of young at one time is very much smaller. Births at which three infants put in an appearance coincidently are in the proportion of only one to 8,649 births in the United States.

And it is interesting that this number, 8,649, is just exactly the square of 93. This indicates to scientists that the formation of triplets is caused by the action of two causes. When only one of these biological accidents occurs, twins appear. Occasionally, however, two occur at the same time and the result is triplets.

Quadruplets are not so much rarer than triplets as might be expected. The proportion of quadruplet births is not one to the cube of 93, as might be imagined, but one to 1,339,975 which is the cube of 71.9.

### Sex Ratio Different

The proportion of girls is much larger for multiple births than single births.

Among single births there are usually 1,057 boys born for each 1,000 girls.

Among twins there are 1,043 boys to each thousand girls.

Among triplets there are only 1,007 boys to each thousand girls.

And among quadruplets, there are only 548 boys to each 1,000 girls.

The record of sex among quintuplets does not fit in with this decreasing ratio of boys to girls with larger numbers at birth, but the sex is not known for all the 35 quintuplets on record. Among

FRATERNAL AND IDENTICAL TWINS

*Fraternal twins are merely children born at the same time. They are developed from different original egg-cells, and may be as unlike in appearance as the little blonde and brunette in the baby carriage. They may even be of opposite sexes. Identical twins, developed from the same cell split in halves, are always of the same sex and more alike than two peas.*

the 25 sets for which the sex is known, 76 were boys and 49 girls.

Scientists do not consider that the original sex ratio is any different for multiple births than for single births, but that the vicissitudes of development are much more of a burden to members of a multiple birth, and girls are constitutionally better able to withstand the difficulties and survive birth.

The fact that the Dionne quintuplets have lived and grown under such very difficult circumstances may be due to the fact that they are all girls.

### A Biological Accident

Human infants usually arrive singly because, in humans, nature ordinarily provides for the release from her storehouse of but one egg cell at a time. It is in this single cell that the human being has his origin.

Under unusual conditions, however, due to causes which are not completely understood, nature allows the release of two or three of these egg cells at a single time.

This trick of nature is not particularly rare. According to Dr. A. F. Guttmacher, Johns Hopkins University physician and scientist, it happens about once in every five monthly cycles, but it is relatively rare that both eggs develop into living creatures.

When they do, twins or triplets are born. But twins or triplets formed in this fashion are not especially like one another except as they share in the general tendency for members of one family to have resemblances. About 70 per cent. of all twins are of this dissimilar, or "fraternal" type.

The twins that are mistaken for one another, that are as alike as two peas in a pod, are formed in a different manner. These identical twins have their origin in but one single cell which begins to develop in the ordinary fashion.

Once in a great while, because of something which disturbs the normal course of development, the cell may separate into two entirely distinct parts, each of which develops into a complete and perfectly balanced human being.

The Dionne quintuplets are likely to have among their number both identical and fraternal twins, for although the chances are small that both these types of biological accidents would occur at the same birth, the chances are even smaller that five separate egg cells would be released from nature's storehouse at the same time and that every one of these should be fertilized and come to birth. The chances are even more remote that a single cell would divide into five parts, for the cell division does not usually produce odd numbers.

*Science News Letter, September 1, 1934*

GEOLOGY

# Over-Production of Crude Oil May Exhaust Supply

FACED with a possible future shortage of one of Uncle Sam's most valuable natural resources, engineers and officials in the oil industry are advising conservation of U. S. oil deposits.

The known, drill-tested reserves of crude oil in the country amount to about 12,000,000,000 barrels. Divide this sum by the yearly consumption of 800,000,000 barrels and the answer is that in about 15 years, unless conservation is exercised, we will run short of one of our greatest economic assets.

At the Fourth Annual Economic Conference for Engineers, held at Johnsonburg, N. J., Charles B. Ames, chairman of the Texas Company's Board, discussed the effects of present administration policies on a petroleum shortage, which will face the nation if steps already taken are not modified.

"A plan should be developed for the effective conservation of our crude oil supply. This can be accomplished through the medium of a compact between the Federal Government and the principal oil-producing states."

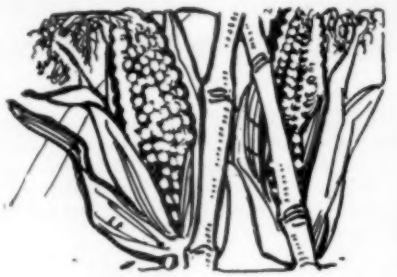
One of the greatest difficulties in the conservation program has been securing cooperation among these states. The NRA afforded the first opportunity for a far-reaching national program.

Although the possibility of control forced the price of crude oil up from 25 cents per barrel in the spring of 1933 to $1.00 in September, 1933, it has not prevented over-production. Since the Oil Code went into effect last September, production of petroleum has exceeded the estimated requirements by about 40,000,000 barrels.

*Science News Letter, September 1, 1934*

METEOROLOGY

## NATURE RAMBLINGS
*by Frank Thone*



### Drought Records

FROM THE excited discussions in the press and by the public at large, it might be thought that drought in the United States was invented in the summer of 1934. This is far from being the case. Although the present dry period is admittedly the costliest in crop and livestock losses that the country has ever seen, there are plenty of dry spots on the map that have been even drier.

Some of them hold records for drought that reach back more than a hundred years, a study of the World Weather Records of the Smithsonian Institution discloses.

In Washington, D. C., precipitation records have been kept for 110 years, since 1824. The Capital's champion dry summer occurred in 1826, with a rainfall of only 18.79 inches.

The longest American weather record is that for Charleston, S. C., which has been kept, with a few interruptions, for 196 years. The old Southern city's driest year was 1850, with 23.69 inches of rain; its wettest was 1765, with 68.76 inches.

Records for the Midwest and Northwest of course do not extend so far back; Weather Bureau stations were established in those regions during the '70's, for the most part. But even at that, they have been able to establish some pretty stiff drought marks for 1934 to shoot at. Cheyenne's driest year, 1876, shows only 5.04 inches of rainfall. Helena, Mont., established a low-precipitation record in 1889, with 6.71 inches. Bismarck, N. D., had only 11.03 inches of rain in the same year. Omaha's all-time record for drought was set as recently as 1910, with 15.49 inches, only about half its "normal" rainfall.

*Science News Letter, September 1, 1934*

PHYSICS

# Need Negative Proton To Explain Spin of Atom Nucleus

TO EXPLAIN why the central nucleus of many kinds of atoms sometimes spins one way and sometimes the other, science has postulated a new kind of entity within the atom tentatively called a negative proton.

The negative proton is still unfound but physicists all over the world are on the lookout for it. It would have the same mass as the cores of hydrogen atoms—the protons—but would have a negative charge of electricity upon it instead of the customary positive charge.

Latest of the scientists to suggest the existence of such a particle is Dr. S. Tolansky of the Imperial College of Science, London, in a report to the British scientific journal *Nature*.

Only a few weeks ago Prof. George Gamow, distinguished Russian expert on atom nuclei from the Polytechnical Institute, Leningrad, U. S. S. R., told the American Physical Society meeting in Ann Arbor that a negative proton would be most helpful in explaining many of the difficulties regarding the stability of certain atoms like beryllium, which are now made to undergo artificial radioactivity.

The original prediction of the negative proton can be credited to Dr. Carl Anderson of California Institute of Technology who in March, 1933, (*See SNL, March 25, 1933, p. 179*) suggested that the emission of positrons from an atom struck by high-energy radiation might be due to the break up of a neutron by the impact. In the collision a positron would come off and a negative proton should remain within the atom. If an electron came off when a neutron broke up an ordinary positive-charged proton should remain inside.

Basically the negative proton enters atomic physics because there is a growing suspicion that the neutron may be composed of two different arrangements of parts which are externally indistinguishable. The neutron is the so-called non-electrical particle because whatever charges it contains are so closely bound that there is no observable external field.

It seems now as though a neutron may be composed of a close union of a proton and an electron whose charges equalize one another; or it may be composed of a negative proton and a positive electron where again the opposite charges neutralize each other. Both these neutrons would have the same weight and the same lack of external charge. They would be hard to tell apart unless they were split apart, but after such a break up the original composition would, of course, no longer exist.

*Science News Letter, September 1, 1934*

CHEMISTRY

## Neutrons From Artificially Radioactive Elements

NEUTRONS have hitherto been produced only by the bombardment of atoms, and have ceased to be emitted when the bombardment stopped. Now comes the announcement from the Paris Academy of Sciences that Irene Curie, F. Joliot, and P. Preiswerk have observed neutrons to be given off bombarded phosphorus for as much as three hours after the bombardment had ceased. The spontaneous emission of neutrons is a new form of radioactivity.

The discovery was not made by accident. The investigators had been bombarding various elements with helium cores (alpha particles), and with neutrons. In the case of phosphorus they found that the artificial radioactivity produced was of two sorts. One had a half life of two minutes forty-five seconds, as had already been discovered by Dr. E. Fermi of Rome. The other had a half life of over three hours.

In studying the possible reactions that might give rise to these radiations the scientists found that one of these possible reactions should result in the emission of neutrons. Accordingly they set up the special apparatus required for the detection of neutrons, and found that neutrons were in fact emitted.

In this process they believe that two unstable atoms are produced. One of them is aluminum with an atomic weight 28. Ordinary aluminum has an atomic weight 27. The other atom is silicon with an atomic weight 31. Ordinary silicon is of weight 28, 29, or 30. Both of these top-heavy atoms disintegrate, according to the reactions worked out by the experimenters, with the production of neutrons.

*Science News Letter, September 1, 1934*

SEISMOLOGY

## Slight Missouri Quake in New Madrid Area

THE EARTHQUAKE that was felt in southeast Missouri Sunday evening, Aug. 19, was also recorded on seismographs, miles distant from the locality. The slight quake occurred in the same general area as the famous New Madrid quake of 1811 which is rated as one of the most severe seismic disturbances in American records.

*Science News Letter, September 1, 1934*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PALEONTOLOGY

# Rhinoceros-Size Pigs Roamed Western Plains

GIANT PIGS of rhinoceros size roamed the plains of North America about 37,000,000 years ago. But horses then were only about the size of deer, and camels, which also lived in North America, were much smaller than those of today.

This somewhat fantastic picture of the distant past is painted by R. A. Stirton, curator of the museum of paleontology at the University of California, who returned recently from South Dakota, where he and his assistants made extensive fossil excavations. These were carried on at Big Spring Canyon, and along the Little White River, near Flint Hill, on the Pine Ridge Indian Reservation. Seventeen skulls of primitive animals were found, as well as various miscellaneous animal remains.

The fossilized remains of the giant pig, the small horses and camel were uncovered in the Flint Hill area, and belong to the lower miocene geologic period. The horses represent a more primitive type than the commonly known three-toed horse. In this section, too, three skulls of primitive beavers were found, which were similar in size to that of the modern beaver. Remains of smaller pigs were also uncovered. These animals are related to the peccaries living in southern Texas today. Bird bones were found, too, representing both water birds and birds of prey.

At Big Spring Canyon animal remains of the pliocene epoch of about ten million years ago were found. These included a pair of lower jawbones of a bear-dog, comparable in size to the jawbones of the big bears of Alaska today, and a mastodon skull about four feet long. In spite of its tremendous proportions, it is believed that the bear-dog was not more of a meat eater than his present day descendant. The mastodon is believed to have been about the size of the modern Indian elephant.

With the fossils, a large quantity of fossilized hackberry seeds were found, indicating the type of forest in or near which the animals lived.

Accompanying Mr. Stirton on the trip were Curtis J. Hesse and Paul O. McGrew, research assistants; Hugo F. Georiz, senior in the University, and Nathan J. Geer, field assistant.

*Science News Letter, September 1, 1934*

RADIO

# Time Required For Travel of Radio Signals Varies at Night

THE TIME required for short radio waves to travel between two distant points fluctuates constantly and rapidly by night to the extent of about ten per cent., whereas by day there is almost no fluctuation.

This is the substance of a report made to the Paris Academy of Sciences by Dr. B. Decaux and Dr. J. B. Galle.

The method used was to send the note of an organ pipe from Paris to Algiers on a radio wave of 24.15 meters, and to return it from there to Paris on a wavelength of 24.65 meters. The note received in Paris was then combined with the direct note from the original organ pipe, reduced to the same intensity, in a cathode ray oscillograph.

In this instrument the outgoing note caused a beam of electrons to vibrate in a vertical direction, the incoming note caused it to vibrate in a horizontal direction. The result of the combined vibrations was to cause a little spot of light, produced by the electrons on a screen, to travel around in an oval or ellipse, called a Lissajou figure. Any variation in the time required for the radio signal to travel from Paris to Algiers and back was indicated at once by a change in the form of this figure. The ellipse became either flatter or rounder.

At night the figure continually changed its form so rapidly that the changes could not be followed. They showed that the time required for the signal to travel to Algiers and back varied by 1/1000 second, the whole time required for the journey being about 1/100 second. During the day the figure remained quite steady.

The same phenomena were observed with waves of 33 meters and even of 349 meters. With the long wave, however, which is within the broadcast range for the United States, the fluctuations were much less rapid.

### Depends on Height of Layer

Radio waves, when traveling long distances are reflected back and forth between the earth's surface and a reflecting layer high above the surface. Because of this zig-zag path, the time of travel between two distant points is greater than if the waves followed the earth's surface. The fluctuations in time shown by the experiments of Drs. Decaux and Galle indicate that the height of the reflecting layer is continually changing at night, but remains at a fairly constant level during the day.

*Science News Letter, September 1, 1934*

AERONAUTICS

## New German Airship Nearing Completion

**See Front Cover**

THE NEW German zeppelin LZ-129, now under construction at Friedrichshafen, Germany, will shortly go into operation on the South Atlantic "run" from Europe to South America.

Only slightly longer than the U. S. Navy airship Macon, the LZ-129 will, however, be the world's largest airship, for it will be buoyed up by over 7,000,000 cubic feet of hydrogen gas. This exceeds the volume of the Macon by some half million cubic feet.

The LZ-129 will supplement the veteran Graf Zeppelin on the trans-Atlantic route across Spain, the South Atlantic and Brazil.

In its internal appointments the LZ-129 will be as luxurious as a crack ocean liner. There will be two promenade decks, large staterooms for passengers, baths with running water, and most unique of all, a special fireproof smoking room. In addition there will be quarters for a crew of 35 and storage space for freight amounting to ten tons.

*Science News Letter, September 1, 1934*

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A thought for next winter: electric-heated uniforms and shoes for traffic policemen have been devised by the General Electric Company.

CHEMISTRY

## Discovery of Bohemium Called All a Mistake

NO super-heavy element bohemium really exists. Announcement made last month, when the supposedly new substance was first reported by Dr. O. Koblic, was premature, now declares the Yugoslavian scientist.

In a recent issue of *Nature*, Dr. Koblic withdraws all claims to the discovery.

The tiny speck of yellow powder obtained from pitchblende, a common source of radioactive material like radium, was not a new element. It was a form of tungsten metal, declares Dr. Koblic, like that found in the small wires inside some electric lights. But the tungsten was in a form not easily identified.

For the month that Dr. Koblic's element bohemium was thought to exist, science had to puzzle over two elements both having atomic number 93. As such they were both heavier than any elements recognized in chemical tables which end with uranium, element 92. The second element 93 was that of Dr. Enrico Fermi, Italian physicist from Rome.

Now the Italian variety of element 93 stands alone. It is radioactive and disintegrates like radium. Substantiation of Dr. Fermi's work is still unreported by other scientists, and until such confirmation the reality of element 93 may be logically questioned.

*Science News Letter, September 1, 1934*

FORESTRY

## No Crop Shortage in Northwestern Tree Seeds

TREES ARE certainly doing their part to keep the forests green and growing, the U. S. Forest Service reports. Race suicide is not one of their characteristics.

Investigations with seed traps on the Wind River Natural Area in the Columbia National Forest in Washington showed a seedfall of 4,219,950 tree seeds in an acre of virgin timber. The forest was a mixture of Douglas fir, hemlock, cedar and true firs, typical of the Douglas fir type of the Pacific Northwest. The hemlock was the most prolific seeder. Despite the seedfall of more than four million per acre, foresters classed it as a comparatively light seed year.

*Science News Letter, September 1, 1934*

## •First Glances at New Books

Additional Reviews On Page 144

**Archaeology**

MAYA RESEARCH, VOL. 1, NO. 1.—Edited by Frans Blom—*Alma Egan Hyatt Foundation, N. Y.*, $5 a year. A brand new quarterly for those interested in the progress of knowledge about the highest civilization of ancient Mexico and Central America. The quarterly opens its covers to the reader, appropriately and impressively, with a stock-taking of the state of Mayan research, by Prof. Tozzer. Passing briefly over what has been achieved, Prof. Tozzer discusses the many absorbing problems that lie ahead. In addition to its longer articles, each issue of the quarterly is to feature a section of notes, in which scholars and students may contribute short first-hand accounts of their discoveries, and problems for discussion.

*Science News Letter, September 1, 1934*

**Astronomy**

EXPOSÉS DE L'ASTRONOMIE STELLAIRE—Pt. I, Histoire de l'Astronomie Stellaire Jusqu'a l'Epoche Contemporaine—H. Mineur—57 p., 15 francs; Pt. II, Eléments de Statistique Mathématique Applicables a l'Etude de l'Astronomie Stellaire—H. Mineur—40 p., 12 francs; Pt. III, Photographie Stellaire: Mesure Photographique des Positions et des Magnitudes des Etoiles—H. Mineur—67 p., 18 francs. *Hermann et Cie., Paris.*

*Science News Letter, September 1, 1934*

**Mathematics**

CALCUL SYMBOLIQUE—Pierre Humbert—*Hermann et Cie., Paris*, 31 p., 10 francs.

*Science News Letter, September 1, 1934*

**Anthropology**

THE OVIMBUNDU OF ANGOLA—Wilfrid D. Hambly—*Field Museum of Natural History*, 362 p., 84 plates in photogravure, $2.75. A detailed ethnological study of a people in southeast Africa.

*Science News Letter, September 1, 1934*

**Meteorology**

FOG—Alexander McAdie—*Macmillan*—23 p., LII plates, $2.50. In fourteen pages of type clouds, fog and fog dissipation methods are discussed. The remainder of the book consists of the beautiful pictures of cloud types taken from Professor McAdie's books on clouds. While admitting fog dissipation is at present impractical on a commercial scale, the author believes it will be done. He presents some of the stepping stones on which research of the future should go forward.

*Science News Letter, September 1, 1934*

**Child Psychology**

YOUR CHILD IS NORMAL—Grace Adams—*Covici, Friede*, 241 p., $2. Parents who have been awed by the admonitions of child psychologists into a feeling of doubt regarding their own competency and their child's kinship with his fellows, will find cheer in the very title of this volume. Just as no one ever saw the "average voter," so no one has ever fondled the "normal child" of pencil and paper averages. If your child deviates from the "norm" that is to be expected. Care of the healthy child is discussed in readable fashion.

*Science News Letter, September 1, 1934*

**Science**

SOME ENIGMAS OF MODERN SCIENCE—Guy Clinton—*Published by author*, 26 p., cloth, 80c.; paper 60c. One man's view of what's wrong with modern science. The main trouble apparently is that science today has changed the rules of the "game." Now it sets up a hypothesis and holds to it until it is disproved. The author would like to go back to the older scheme of maintaining that a postulate fails unless supported by positive evidence.

*Science News Letter, September 1, 1934*

**Engineering**

POWER SUPPLY ECONOMICS—Joel D. Justin and William G. Metvine—*Wiley*, 276 p., $3.50.

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**Occupations**

NEW CAREERS FOR YOUTH—Walter B. Pitkin—*Simon and Schuster*, 236 p., $1.50. Highly inspirational, this will undoubtedly be useful to some young people now looking for jobs. On Mr. Pitkin's hopeful fields list are: the new housing, air conditioning, quality goods and service, retailing, personnel workers, applied psychology, vocational guidance, banking, hotels, cost accounting, appraisers, and several others. He also gives advice on how to make your own job and he lists what he considers overcrowded fields.

*Science News Letter, September 1, 1934*

**Engineering**

DIESEL HANDBOOK — Julius Rosbloom—*Clement V. Ritter*, 352 p., $5.00. A practical book of instruction for engineers and students on modern Diesel engineering, land, marine, locomotive, aero, automotive and portable installations.

*Science News Letter, September 1, 1934*

# ●First Glances at New Books

Additional Reviews On Page 143

**Astronomy**

HANDBOOK OF THE HEAVENS—Hubert J. Bernhard, ed.—*American Museum of Natural History,* 54 p., 50c. With its active members consisting of boys and girls of high school age and with the guidance of the departments of education and astronomy of the museum, the Junior Astronomy Club which produced this booklet is a striking development. Briefly and simply the essential facts that interest amateurs are told in this handbook, written by the boys and girls themselves. Such publications and such clubs are important media for the understanding of science by the public.

*Science News Letter, September 1, 1934*

**Meteorology**

DAYTIME RADIATION AT BLUE HILL OBSERVATORY IN 1933, WITH APPLICATION TO TURBIDITY IN AMERICAN AIR MASSES—Bernhard Haurwitz—*Harvard Univ. Press,* 30 p., 50c. A physical study, of significance in the "new meteorology" just coming into its own in America, based on the relations of moving air masses.

*Science News Letter, September 1, 1934*

**Geography**

YOUNG GEOGRAPHERS—Lucy Sprague Mitchell—*John Day,* 102 p., $1. A book for teachers, containing many suggestions for the effective guiding of the natural location-curiosity of children, and its building up into a knowledge of geography that is a science rather than merely a series of memory drills.

*Science News Letter, September 1, 1934*

**Mathematics**

ANALYTIC GEOMETRY—Frederick S. Nowlan—*McGraw-Hill Book Co.,* 352 p., $2.25. Second edition of a text for university use.

*Science News Letter, September 1, 1934*

**Zoology**

MORE FUR-BEARING ANIMALS—Hardison Patton—*Clement V. Ritter,* 191 p., $3.00. This book is a supplement to the author's earlier work, *Raising Fur-Bearing Animals.* The animals here discussed are angora wool rabbit, fitch, and nutria or fisher.

*Science News Letter, September 1, 1934*

**Zoology**

GENERAL ZOOLOGY—Frederick H. Kreckner—*Holt,* 634 p., $3.50. A comprehensive general text, aimed primarily at the students whose only formal contact with biological science will be the first-year course in college.

*Science News Letter, September 1, 1934*

**Entomology**

A GENERAL TEXTBOOK OF ENTOMOLOGY—A. D. Imms—*Dutton,* 727 p., $10.80. That Imm's textbook, at the end of its tenth year, must enter a third large edition is testimony enough of its success. The author notes that much emendation and rewriting has been undertaken, particularly in the sections dealing with anatomy and physiology, and some rearrangements have been made necessary by late developments in taxonomy.

*Science News Letter, September 1, 1934*

**Highways**

PROCEEDINGS OF THE THIRTEENTH ANNUAL MEETING OF THE HIGHWAY RESEARCH BOARD—Roy W. Crum, ed. *National Research Council,* 410 p., $2.00. Part I consisting of reports of research committees and papers. The papers, which constitute original publications of technical importance in this field, are grouped under the headings: Highway Transportation Economics, Design, Materials and Construction, Maintenance, Traffic.

*Science News Letter, September 1, 1934*

**Mechanics**

MECHANICS, A TEXT-BOOK FOR ENGINEERING STUDENTS—Frank Gardner —*Oxford,* 256 p., $2.75.

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**Biography**

AMERICAN INVENTORS—C. J. Hylander—*Macmillan,* 216 p., $2. Life histories of 19 of the men who created new industries and devices which we who are benefited often take for granted. There are many illustrations.

*Science News Letter, September 1, 1934*

**Radio**

OFFICIAL SHORT-WAVE RADIO MANUAL, 1934—Hugo Gernsback, Editor—*Short Wave Craft,* 240 p., $2.50. A comprehensive and voluminous loose leaf publication which will interest those engaged in short-wave construction and experimentation.

*Science News Letter, September 1, 1934*

**National Parks**

FAUNA OF THE NATIONAL PARKS OF THE UNITED STATES—George M. Wright, Joseph S. Dixon and Ben H. Thompson—*Govt. Print. Off.,* 157 p., 20c. This publication, constituting number 1 of a new Fauna Series of the U. S. National Parks Wild Life Survey, undertakes to present a broad general view of the ecological relations of animal life in the National Parks, and especially to outline wherein their world is out of joint and what must be done to set it right.

*Science News Letter, September 1, 1934*

**Geology**

AN OUTLINE OF THE PRINCIPLES OF GEOLOGY—Richard M. Field—*Barnes and Noble,* 196 p., 75c. An exceedingly compact little book, bristling with the things a properly prepared geologist needs to know but utterly stripped of non-essential detail. Recommended especially for advanced students who need to give their general background a "going over" before facing an examining board or other critical test of their knowledge.

*Science News Letter, September 1, 1934*

**Geology**

THE NEWER APPALACHIANS OF THE SOUTH. PART I: BETWEEN THE POTOMAC AND THE NEW RIVERS—Frank J. Wright—*Denison Univ. Bull.,* 105 p., 28 pl., $1.25. A careful topographic study in a region rich with early American history that flowed with the rivers and adventured over the ridges, of interest, therefore, to the historian and social economist as well as to the geologist and geographer.

*Science News Letter, September 1, 1934*

**Engineering**

TEXT-BOOK ON HYDRAULICS—George E. Russell—*Holt,* 447 p., $3.90. Fourth edition of an excellent text. The author is professor of hydraulics at Massachusetts Institute of Technology.

*Science News Letter, September 1, 1934*

**Book Publishing**

TWENTY-FIFTH ANNIVERSARY—*McGraw-Hill Book Company, Inc.,* 16 p., free.

*Science News Letter, September 1, 1934*

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